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1. ☒ *Fee Transmittal Form (e.g. PTO/SB/17)
(Submit an original and a duplicate for fee processing)

2. ☒ Specification Total Pages (18)

(preferred arrangement set forth below)

- Descriptive title of the invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (if filed)
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

3. ☒ Formal Drawing(s) (35 U.S.C. 113) Total Sheets (11)

4. ☒ Oath or Declaration

- a. ☒ Newly executed (original or copy)

- b. ☐ Copy from a prior application (37 C.F.R. § 1.63(d))

- i. ☐ DELETION OF INVENTOR(S)

Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

5. ☐ Microfiche Computer Program (Appendix)
6. Nucleotide and/or Amino Acid Sequence Submission
(If applicable, all necessary)
- a. ☐ Computer Readable Copy
 - b. ☐ Paper Copy (identical to computer copy)
 - c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. ☐ Assignment Papers (cover sheet & document(s))
8. ☐ 37 C.F.R. § 3.73(b) Statement ☐ Power of Attorney
(when there is an assignee)
9. ☐ English Translation Document (if applicable)
10. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
11. ☐ Preliminary Amendment
12. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
13. ☒ *Small Entity ☐ Statement filed in prior application
Statement(s) Status still proper and desired
(PTO/SB/09-12)
14. ☐ Certified Copy of Priority Document(s)
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15. ☐ Other:

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☐ Customer No. or Bar Code Label

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(insert Customer No. or Attach bar code label here)

Address

Oppenheimer Wolff & Donnelly LLP
45 South Seventh Street
3400 Plaza VII

City

Minneapolis

State

Minnesota

Zip Code

55402

Country

USA

Telephone

612-607-7539

Fax

612-607-7100

Name (Print/Type)

Alan D. Kamrath

Registration No. (Attorney/Agent)

28,227

Signature

Alan D. Kamrath

Date

April 3, 2000

Applicant or Patentee: Bobby HU

Docket #: _____

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Art Unit: _____

For: Biasing Arrangement for a Pawl of a Reversible Ratchet-Type Wrench

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As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled Biassing Arrangement for a Pawl of a Reversible Ratchet-Type Wrench

by _____

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☐ Patent application serial number _____, filed _____.
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	Inventor 1	Inventor 2	Inventor 3
Name	Bobby HU		
Signature			
Date	March 17, 2000		

Biasing Arrangement for a Pawl of a Reversible Ratchet-Type Wrench

Background of the Invention

1. Field of the Invention

The present invention relates to a biasing arrangement for a pawl of a reversible ratchet-type wrench to provide reliable ratcheting. The present invention also relates to an improved head structure for a ratchet-type wrench to lower the manufacture cost.

2. Description of the Related Art

U.S. Patent No. 2,957,377 issued to Hare on Oct. 25, 1960 discloses a reversible ratchet type wrench comprising a body 10 having a handle 11 and a head 12. A cap 39 and an annular wall 44 are provided to upper side and lower side of the head 12, respectively. Yet, this increases the assembly time and the manufacture cost and adversely affects the appearance. A shifting lever 35 is retained in place by a spring 33 that is located in a cylindrical opening 34. Nevertheless, formation of the cylindrical opening 34 that extends inclined upward is relatively difficult. In addition, formation of the cavity 16 having converging straight sides 17, 18 which diverge in the direction of the periphery of rotatable member 14 requires expensive and accurate computer-numeric-control (CNC), which further results in an increase in the cost together with a low production rate. This is why such reversible ratchet type wrench is hardly seen in the market.

Figs. 10 and 11 illustrate another conventional ratchet type wrench comprising a handle 12' and a head 11'. The head 11' is machined to form four consecutive compartments for receiving the drive member 20', the pawl 30' and the shifting lever 40', wherein three of the compartments can be formed by cutting, yet the remaining one must be machined by CNC. Further, the resultant head structure is relatively weak and thus has a poor torque-bearing capacity. In addition, the movement of the pawl 30' for changing ratcheting direction is found unreliable, as it is achieved via transmission of the hook end 442' of a spring 44' attached to the shifting lever 40'.

Summary of the Invention

In accordance with a first aspect of the invention, a reversible ratchet-type wrench comprises:

a handle;

a head extended from the handle and including a hole, a web being defined between the handle and the head, a cavity being defined in the web and communicated with the hole, the web further including a compartment having a first end communicated with the cavity and a second end communicated with outside, thereby leaving a bridge in the web;

a drive member rotatably mounted in the hole of the head, the drive member including a plurality of teeth formed on an outer periphery thereof;

a pawl mounted in the cavity and including a first side with a plurality of ratchet teeth for releasably engaging with the teeth of the drive member;

a switch member including a turn-piece for manual operation and an actuating plate extended from the turn-piece and rotatably received in the second end of the compartment of the web, the switch member being switchable between two positions for changing ratcheting direction of the drive member; and

a biasing means mounted in the cavity and between the pawl and the actuating plate for biasing the ratchet teeth of the pawl to engage with the teeth of the drive member.

An inner periphery defining the hole of the head includes a first annular groove. The outer periphery of the drive member includes a second annular groove. A C-clip is received in the first annular groove and the second annular groove, thereby rotatably retaining the drive member in the head.

The biasing means includes an elastic element and a peg. The pawl further includes a second side with a recess. The peg has a first end movably received in the recess of the pawl and a second end. The elastic element biases the second end of the peg for exerting a force to the peg toward the pawl, thereby urging the ratchet teeth of the pawl to engage with the teeth of the gear wheel.

1 In an embodiment of the invention, the actuating plate of the switch member includes a
2 receptacle that faces the cavity. The elastic element includes a first end received in the
3 receptacle and a second end outside the receptacle and configured to be attached to the
4 actuating plate. The second end of the peg is received in the elastic element. The first end of
5 the elastic element is configured to bias the second end of the peg toward the recess of the
6 pawl.

7 In another embodiment of the invention, the actuating plate of the switch member
8 includes a first receptacle that faces the cavity, the first receptacle having a first end wall. The
9 second end of the peg is received in the first receptacle and includes a second receptacle with a
10 second end wall. Two ends of the elastic element are attached between the first end wall and
11 the second end wall.

12 The drive member may be a gear wheel including an inner periphery for driving a
13 fastener. Alternatively, the drive member includes a drive column for releasably engaging with
14 a socket. The head includes an end wall with an opening, and the drive member includes a
15 stub rotatably received in the opening.

16 In accordance with a second aspect of the invention, a reversible ratchet-type wrench
17 comprises:

18 a handle;

19 a head extended from the handle and including a hole, a web being defined between the
20 handle and the head, a cavity being defined in the web and communicated with the hole, the
21 web further including a compartment communicated with the cavity;

22 a drive member rotatably mounted in the hole of the head, the drive member including a
23 plurality of teeth formed on an outer periphery thereof;

24 a pawl mounted in the cavity and including a first side with a plurality of ratchet teeth
25 for releasably engaging with the teeth of the drive member, the pawl further including a
26 second side with a recess;

1 a switch member including a turn-piece for manual operation and an actuating plate
2 extended from the turn-piece and rotatably received in the compartment of the web, the switch
3 member being switchable between two positions for changing ratcheting direction of the drive
4 member; and

5 a biasing means mounted in the cavity and between the recess of the pawl and the
6 actuating plate for biasing the ratchet teeth of the pawl to engage with the teeth of the drive
7 member, the biasing means including an elastic element and a peg, the peg having a first end
8 movably received in the recess of the pawl and a second end, the elastic element biasing the
9 second end of the peg for exerting a force to the peg toward the pawl, thereby urging the
10 ratchet teeth of the pawl to engage with the teeth of the gear wheel;

11 the actuating plate of the switch member including a receptacle that faces the cavity, the
12 elastic element including a first end received in the receptacle and a second end outside the
13 receptacle and configured to be attached to the actuating plate, the second end of the peg being
14 received in the elastic element, the first end of the elastic element being configured to bias the
15 second end of the peg toward the recess of the pawl.

16 In accordance with a third aspect of the invention, a reversible ratchet-type wrench
17 comprises:

18 a handle;

19 a head extended from the handle and including a hole, a web being defined between the
20 handle and the head, a cavity being defined in the web and communicated with the hole, the
21 web further including a compartment communicated with the cavity;

22 a drive member rotatably mounted in the hole of the head, the drive member including a
23 plurality of teeth formed on an outer periphery thereof;

24 a pawl mounted in the cavity and including a first side with a plurality of ratchet teeth
25 for releasably engaging with the teeth of the drive member, the pawl further including a
26 second side with a recess;

1 a switch member including a turn-piece for manual operation and an actuating plate
2 extended from the turn-piece and rotatably received in the compartment of the web, the switch
3 member being switchable between two positions for changing ratcheting direction of the drive
4 member; and

5 a biasing means mounted in the cavity and between the recess of the pawl and the
6 actuating plate for biasing the ratchet teeth of the pawl to engage with the teeth of the drive
7 member, the biasing means including an elastic element and a peg, the peg having a first end
8 movably received in the recess of the pawl and a second end, the elastic element biasing the
9 second end of the peg for exerting a force to the peg toward the pawl, thereby urging the
10 ratchet teeth of the pawl to engage with the teeth of the gear wheel;

11 the actuating plate of the switch member including a first receptacle that faces the cavity,
12 the first receptacle having a first end wall, the second end of the peg being received in the first
13 receptacle and including a second receptacle with a second end wall, the elastic element
14 having two ends that are attached between the first end wall and the second end wall.

15 In accordance with a fourth aspect of the invention, a reversible ratchet-type wrench
16 comprises:

17 a handle;

18 a head extended from the handle and including a hole, a web being defined between the
19 handle and the head, a cavity being defined in the web and communicated with the hole, the
20 web further including a compartment communicated with the cavity;

21 a drive member rotatably mounted in the hole of the head, the drive member including a
22 plurality of teeth formed on an outer periphery thereof;

23 a pawl mounted in the cavity and including a first side with a plurality of ratchet teeth
24 for releasably engaging with the teeth of the drive member, the pawl further including a
25 second side with a recess;

1 a switch member rotatably received in the compartment of the web, the switch member
2 being switchable between two positions for changing ratcheting direction of the drive member;
3 and

4 a biasing means mounted in the cavity and having a first end slidably received in the
5 recess of the pawl and a second end attached to the switch member for biasing the ratchet teeth
6 of the pawl to engage with the teeth of the drive member.

7 Other objects, advantages, and novel features of the invention will become more
8 apparent from the following detailed description when taken in conjunction with the
9 accompanying drawings.

10 **Brief Description of the Drawings**

11 Fig. 1 is an exploded perspective view of an end portion of a first embodiment of a
12 ratchet-type wrench in accordance with the present invention.

13 Fig. 2 is a sectional view of the end portion of the first embodiment of the ratchet-type
14 wrench in accordance with the present invention.

15 Fig. 3 is a top view, partly sectioned, of the end portion of the first embodiment of the
16 ratchet-type wrench in accordance with the present invention, wherein the wrench is in a status
17 allowing counterclockwise ratcheting.

18 Fig. 4 is a view similar to Fig. 3, wherein the wrench is in a status allowing free rotation
19 in both directions.

20 Fig. 5 is a view similar to Fig. 3, wherein the wrench is in a status allowing clockwise
21 ratcheting.

22 Fig. 6 is a perspective view of the end portion of the first embodiment of the ratchet-
23 type wrench in accordance with the present invention.

24 Fig. 7 is a sectional view illustrating a second embodiment of the ratchet-type wrench in
25 accordance with the present invention.

26 Fig. 8 is a top view of an end portion of a third embodiment of the ratchet-type wrench
27 in accordance with the present invention.

1 Fig. 9 is a sectional view illustrating a fourth embodiment of the ratchet-type wrench in
2 accordance with the present invention.

3 Fig. 10 is an exploded perspective view of a conventional ratchet type wrench.

4 Fig. 11 is a sectional view of a head portion of the conventional ratchet type wrench in
5 Fig. 10.

6 **Detailed Description of the Preferred Embodiments**

7 Referring to Figs. 1 through 9 and initially to Figs. 1, 2, 3, and 6, a ratchet-type wrench
8 10 in accordance with the present invention generally includes a handle 12 and a head 11
9 having a hole 13. An inner periphery 132 defining the hole 13 of the head 11 includes an
10 annular groove 131 in a lower portion thereof. A web 17 is defined between the head 11 and
11 the handle 12. A cavity 14 is defined in the web 17. Also defined in the web 17 is a
12 compartment 15 that is substantially L-shape and includes an inner end communicated with
13 the cavity 14 and an outer end communicated with outside, thereby leaving a bridge 16 on the
14 web 17. The outer end of the compartment 15 is preferably circular. The bridge 16 increases
15 the strength of the head 11 and the handle 12, thereby providing a higher torque-bearing
16 capacity.

17 A drive member (in the form of a gear wheel 20 in this embodiment) is mounted in the
18 head 11 and includes an inner periphery 24 for driving a fastener (not shown) and an outer
19 periphery 25. The outer periphery 25 includes a recessed upper end portion 22, a lower end
20 portion 23, and a middle portion with a plurality of recessed teeth 21. The lower end portion
21 23 includes an annular groove 231. A C-clip 30 is received in the annular groove 231 of the
22 lower end portion 23 and the annular groove 131 of the head 13, thereby rotatably retaining
23 the gear wheel 20 in the head 11 of the wrench 10, best shown in Fig. 2.

24 A pawl 40 is mounted in cavity 14 in the web 17 and includes ratchet teeth 41 on a side
25 thereof for engaging with teeth 21 of the gear wheel 20. The other side of the pawl 40 further
26 includes a recess 42 having two ends 421 and 422, which will be described later.

1 Still referring to Figs. 1 through 3, a switch member 50 is rotatably mounted to the
2 second end of the compartment 15. In this embodiment, the switch member 50 includes a turn-
3 piece 51 outside the compartment 15 for manual operation and an actuating plate 52 extended
4 from the turn-piece 51 and having a receptacle 521 that faces the cavity 14. A biasing means
5 60 is mounted in the receptacle 521 and includes an elastic element 62 and a peg 61. In this
6 embodiment, as illustrated in Fig. 2, the elastic element 62 includes a first end 621 configured
7 to bias an end 612 of the peg 61. A second end 622 of the elastic element 62 is configured to
8 have a larger diameter so as to bear against and thus be attached to the actuating plate 52 in an
9 area surrounding an opening section (not labeled) of the receptacle 521, as shown in Fig. 3.

10 In assembly, the switch member 50 is mounted in the compartment 15 and the biasing
11 means 60 is mounted into the receptacle 521 of the switch member 50 via the cavity 14 with
12 the elastic element 62 surrounding a part of the peg 61. The end 612 of the peg 61 bears
13 against the first end 621 of the elastic element 62. The pawl 40 is mounted into the cavity 14
14 with the other end 612 of the peg 61 extended into the recess 42 of the pawl 40. The C-clip 30
15 is placed into the hole 132 and the gear wheel 20 is then mounted in the hole 132 with the C-
16 clip 30 received in the annular grooves 131 and 231, thereby completing the assembly. Thus,
17 the assembly procedure is simple and can be accomplished quickly by a C-clip 30 without the
18 aid of any screw or cover.

19 The ratchet-type wrench in Fig. 3 is in a status allowing counterclockwise ratcheting
20 (free rotation in clockwise direction), in which the other end 611 of the peg 61 bears against an
21 end 422 of the recess 42 of the pawl 40, and an end 44 of the pawl 40 bears against a wall
22 portion defining the cavity 14. When a change in the ratcheting direction is required, the user
23 may switch the turn-piece 51 and thus cause the biasing means 60 to move. Fig. 4 shows a
24 transition position for the ratchet-type wrench that allows free rotation in both directions. As
25 illustrated in Fig. 4, the elastic element 62 is stretched during rotational movement of the turn-
26 piece. When the turn-piece 51 reaches its predetermined position shown in Fig. 5, the other
27 end 611 of the peg 61 bears against the other end 421 of the recess 42 of the pawl 40, and the

1 other end 43 of the pawl 40 bears against another wall portion defining the cavity 14. Thus,
2 the ratchet-type wrench is in a status allowing clockwise ratcheting and free rotation in the
3 counterclockwise direction.

4 Fig. 7 illustrates a second embodiment in accordance with the present invention,
5 wherein the gear wheel 20 is replaced by a drive member 70 having a drive column 73 with an
6 engaging means 80 for releasably engaging with a socket (not shown). The drive member 70
7 includes an outer periphery having a plurality of teeth 71 for engaging with the pawl teeth 41.
8 An annular groove 731 is defined in a lower portion of the outer periphery of the drive
9 member 70 for engaging with the C-clip 30, which is identical to that disclosed above. In
10 addition, the drive member 70 includes a stub 72 on a top thereof, and the upper portion of the
11 head 11 is modified to include an end wall 133 with an opening 134 for rotatably receiving the
12 stub 72 of the drive member 70, thereby providing stable rotational movement for the drive
13 member 70.

14 Fig. 8 illustrates a third embodiment in accordance with the present invention. It is noted
15 that the biasing means (now designated by 90) in this embodiment includes a pin 92 that is
16 having a receptacle 911 for receiving an end of the elastic element 92. Thus, the elastic
17 element 92 is attached between an end wall (not labeled) defining the receptacle 911 of the pin
18 92 and an end wall (not labeled) defining the receptacle 521 of the switch member 50.

19 Fig. 9 illustrates a fourth embodiment in accordance with the present invention. It is
20 noted that the biasing means 90 in the fourth embodiment is identical to that of the third
21 embodiment, and the drive member 70 in the fourth embodiment is identical to that of the
22 second embodiment.

23 Although the invention has been explained in relation to its preferred embodiment, it is
24 to be understood that many other possible modifications and variations can be made without
25 departing from the spirit and scope of the invention as hereinafter claimed.

1 **What is claimed is:**

2 1. A reversible ratchet-type wrench comprising:

3 a handle;

4 a head extended from the handle and including a hole, a web being defined between the
5 handle and the head, a cavity being defined in the web and communicated with the hole, the
6 web further including a compartment having a first end communicated with the cavity and a
7 second end communicated with outside, thereby leaving a bridge in the web;

8 a drive member rotatably mounted in the hole of the head, the drive member including a
9 plurality of teeth formed on an outer periphery thereof;

10 a pawl mounted in the cavity and including a first side with a plurality of ratchet teeth
11 for releasably engaging with the teeth of the drive member;

12 a switch member including a turn-piece for manual operation and an actuating plate
13 extended from the turn-piece and rotatably received in the second end of the compartment of
14 the web, the switch member being switchable between two positions for changing ratcheting
15 direction of the drive member; and

16 a biasing means mounted in the cavity and between the pawl and the actuating plate for
17 biasing the ratchet teeth of the pawl to engage with the teeth of the drive member.

18 2. The reversible ratchet-type wrench as claimed in claim 1, wherein an inner periphery
19 defining the hole of the head includes a first annular groove, and wherein the outer periphery
20 of the drive member includes a second annular groove, further comprising a C-clip received in
21 the first annular groove and the second annular groove, thereby rotatably retaining the drive
22 member in the head.

23 3. The reversible ratchet-type wrench as claimed in claim 1, wherein the biasing means
24 includes an elastic element and a peg, the pawl further including a second side with a recess,
25 the peg having a first end movably received in the recess of the pawl and a second end, the
26 elastic element biasing the second end of the peg for exerting a force to the peg toward the
27 pawl, thereby urging the ratchet teeth of the pawl to engage with the teeth of the gear wheel.

1 13. The reversible ratchet-type wrench as claimed in claim 1, wherein the drive member
2 includes a drive column for releasably engaging with a socket.

3 14. The reversible ratchet-type wrench as claimed in claim 13, wherein the head includes an
4 end wall with an opening, and wherein the drive member includes a stub rotatably received in
5 the opening.

6 15. A reversible ratchet-type wrench comprising:

7 a handle;

8 a head extended from the handle and including a hole, a web being defined between the
9 handle and the head, a cavity being defined in the web and communicated with the hole, the
10 web further including a compartment communicated with the cavity;

11 a drive member rotatably mounted in the hole of the head, the drive member including a
12 plurality of teeth formed on an outer periphery thereof;

13 a pawl mounted in the cavity and including a first side with a plurality of ratchet teeth
14 for releasably engaging with the teeth of the drive member, the pawl further including a
15 second side with a recess;

16 a switch member including a turn-piece for manual operation and an actuating plate
17 extended from the turn-piece and rotatably received in the compartment of the web, the switch
18 member being switchable between two positions for changing ratcheting direction of the drive
19 member; and

20 a biasing means mounted in the cavity and between the recess of the pawl and the
21 actuating plate for biasing the ratchet teeth of the pawl to engage with the teeth of the drive
22 member, the biasing means including an elastic element and a peg, the peg having a first end
23 movably received in the recess of the pawl and a second end, the elastic element biasing the
24 second end of the peg for exerting a force to the peg toward the pawl, thereby urging the
25 ratchet teeth of the pawl to engage with the teeth of the gear wheel;

26 the actuating plate of the switch member including a receptacle that faces the cavity, the
27 elastic element including a first end received in the receptacle and a second end outside the

1 receptacle and configured to be attached to the actuating plate, the second end of the peg being
2 received in the elastic element, the first end of the elastic element being configured to bias the
3 second end of the peg toward the recess of the pawl.

4 16. The reversible ratchet-type wrench as claimed in claim 15, wherein the drive member is a
5 gear wheel including an inner periphery adapted to drive a fastener.

6 17. The reversible ratchet-type wrench as claimed in claim 15, wherein the drive member
7 includes a drive column for releasably engaging with a socket.

8 18. The reversible ratchet-type wrench as claimed in claim 17, wherein the head includes an
9 end wall with an opening, and wherein the drive member includes a stub rotatably received in
10 the opening.

11 19. The reversible ratchet-type wrench as claimed in claim 15, wherein an inner periphery
12 defining the hole of the head includes a first annular groove, and wherein the outer periphery
13 of the drive member includes a second annular groove, further comprising a C-clip received in
14 the first annular groove and the second annular groove, thereby rotatably retaining the drive
15 member in the head.

16 20. The reversible ratchet-type wrench as claimed in claim 15, wherein the compartment of the
17 web has a first end communicated with the cavity and a second end communicated with
18 outside, thereby leaving a bridge in the web.

19 21. A reversible ratchet-type wrench comprising:

20 a handle;

21 a head extended from the handle and including a hole, a web being defined between the
22 handle and the head, a cavity being defined in the web and communicated with the hole, the
23 web further including a compartment communicated with the cavity;

24 a drive member rotatably mounted in the hole of the head, the drive member including a
25 plurality of teeth formed on an outer periphery thereof;

1 a pawl mounted in the cavity and including a first side with a plurality of ratchet teeth
2 for releasably engaging with the teeth of the drive member, the pawl further including a
3 second side with a recess;

4 a switch member including a turn-piece for manual operation and an actuating plate
5 extended from the turn-piece and rotatably received in the compartment of the web, the switch
6 member being switchable between two positions for changing ratcheting direction of the drive
7 member; and

8 a biasing means mounted in the cavity and between the recess of the pawl and the
9 actuating plate for biasing the ratchet teeth of the pawl to engage with the teeth of the drive
10 member, the biasing means including an elastic element and a peg, the peg having a first end
11 movably received in the recess of the pawl and a second end, the elastic element biasing the
12 second end of the peg for exerting a force to the peg toward the pawl, thereby urging the
13 ratchet teeth of the pawl to engage with the teeth of the gear wheel;

14 the actuating plate of the switch member including a first receptacle that faces the cavity,
15 the first receptacle having a first end wall, the second end of the peg being received in the first
16 receptacle and including a second receptacle with a second end wall, the elastic element
17 having two ends that are attached between the first end wall and the second end wall.

18 22. The reversible ratchet-type wrench as claimed in claim 21, wherein the drive member is a
19 gear wheel including an inner periphery adapted to drive a fastener.

20 23. The reversible ratchet-type wrench as claimed in claim 21, wherein the drive member
21 includes a drive column for releasably engaging with a socket.

22 24. The reversible ratchet-type wrench as claimed in claim 23, wherein the head includes an
23 end wall with an opening, and wherein the drive member includes a stub rotatably received in
24 the opening.

25 25. The reversible ratchet-type wrench as claimed in claim 21, wherein an inner periphery
26 defining the hole of the head includes a first annular groove, and wherein the outer periphery
27 of the drive member includes a second annular groove, further comprising a C-clip received in

1 the first annular groove and the second annular groove, thereby rotatably retaining the drive
2 member in the head.

3 26. The reversible ratchet-type wrench as claimed in claim 21, wherein the compartment of the
4 web has a first end communicated with the cavity and a second end communicated with
5 outside, thereby leaving a bridge in the web.

6 27. A reversible ratchet-type wrench comprising:

7 a handle;

8 a head extended from the handle and including a hole, a web being defined between the
9 handle and the head, a cavity being defined in the web and communicated with the hole, the
10 web further including a compartment communicated with the cavity;

11 a drive member rotatably mounted in the hole of the head, the drive member including a
12 plurality of teeth formed on an outer periphery thereof;

13 a pawl mounted in the cavity and including a first side with a plurality of ratchet teeth
14 for releasably engaging with the teeth of the drive member, the pawl further including a
15 second side with a recess;

16 a switch member rotatably received in the compartment of the web, the switch member
17 being switchable between two positions for changing ratcheting direction of the drive member;

18 and

19 a biasing means mounted in the cavity and having a first end slidably received in the
20 recess of the pawl and a second end attached to the switch member for biasing the ratchet teeth
21 of the pawl to engage with the teeth of the drive member.

22 28. The reversible ratchet-type wrench as claimed in claim 27, wherein an inner periphery
23 defining the hole of the head includes a first annular groove, and wherein the outer periphery
24 of the drive member includes a second annular groove, further comprising a C-clip received in
25 the first annular groove and the second annular groove, thereby rotatably retaining the drive
26 member in the head.

1 35. The reversible ratchet-type wrench as claimed in claim 30, wherein the compartment of the
2 web has a first end communicated with the cavity and a second end communicated with
3 outside, thereby leaving a bridge in the web.

4 36. The reversible ratchet-type wrench as claimed in claim 27, wherein the drive member is a
5 gear wheel including an inner periphery adapted to drive a fastener.

6 37. The reversible ratchet-type wrench as claimed in claim 27, wherein the drive member
7 includes a drive column for releasably engaging with a socket.

8 38. The reversible ratchet-type wrench as claimed in claim 37, wherein the head includes an
9 end wall with an opening, and wherein the drive member includes a stub rotatably received in
10 the opening.

11 39. The reversible ratchet-type wrench as claimed in claim 27, wherein the compartment of the
12 web has a first end communicated with the cavity and a second end communicated with
13 outside, thereby leaving a bridge in the web.

Abstract of the Disclosure

A reversible ratchet-type wrench includes a handle and a head extended from the handle and having a hole. A web is defined between the handle and the head, and a cavity is defined in the web and communicated with the hole. The web further includes a compartment having a first end communicated with the cavity and a second end communicated with outside, thereby leaving a bridge in the web. A drive member is rotatably mounted in the hole of the head. A pawl is mounted in the cavity and includes a first side with ratchet teeth for releasably engaging with teeth on an outer periphery of the drive member. A switch member includes a turn-piece for manual operation and an actuating plate extended from the turn-piece and rotatably received in the second end of the compartment of the head. The switch member is switchable between two positions for changing ratcheting direction of the drive member. A biasing arrangement is mounted in the cavity and between the pawl and the actuating plate for biasing the ratchet teeth of the pawl to engage with the teeth of the drive member.

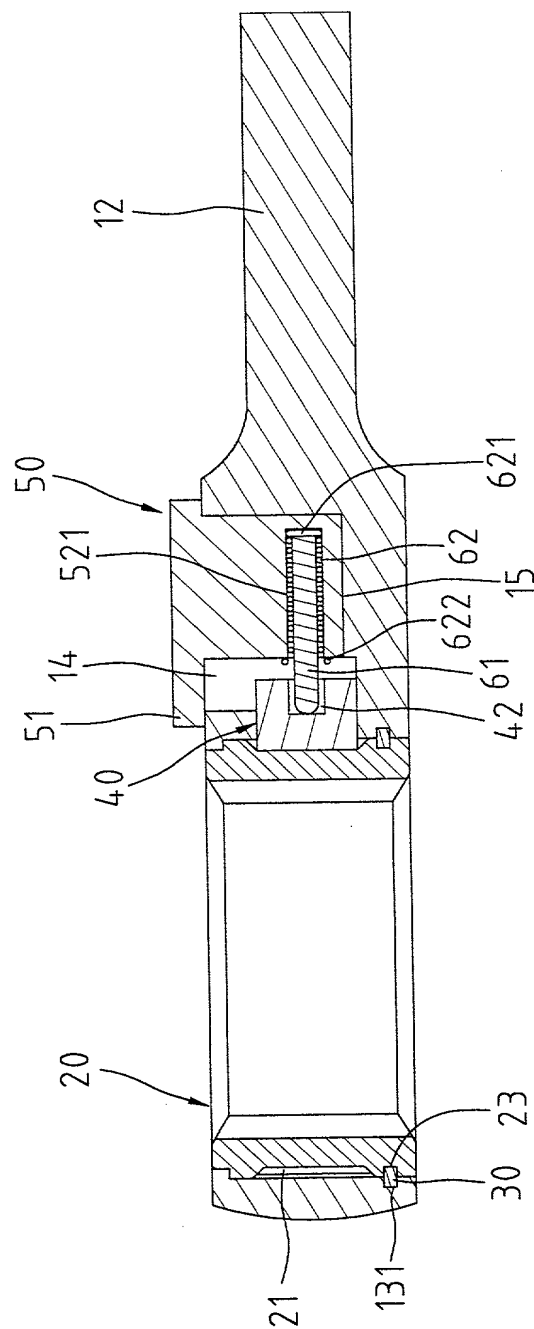


Fig. 2

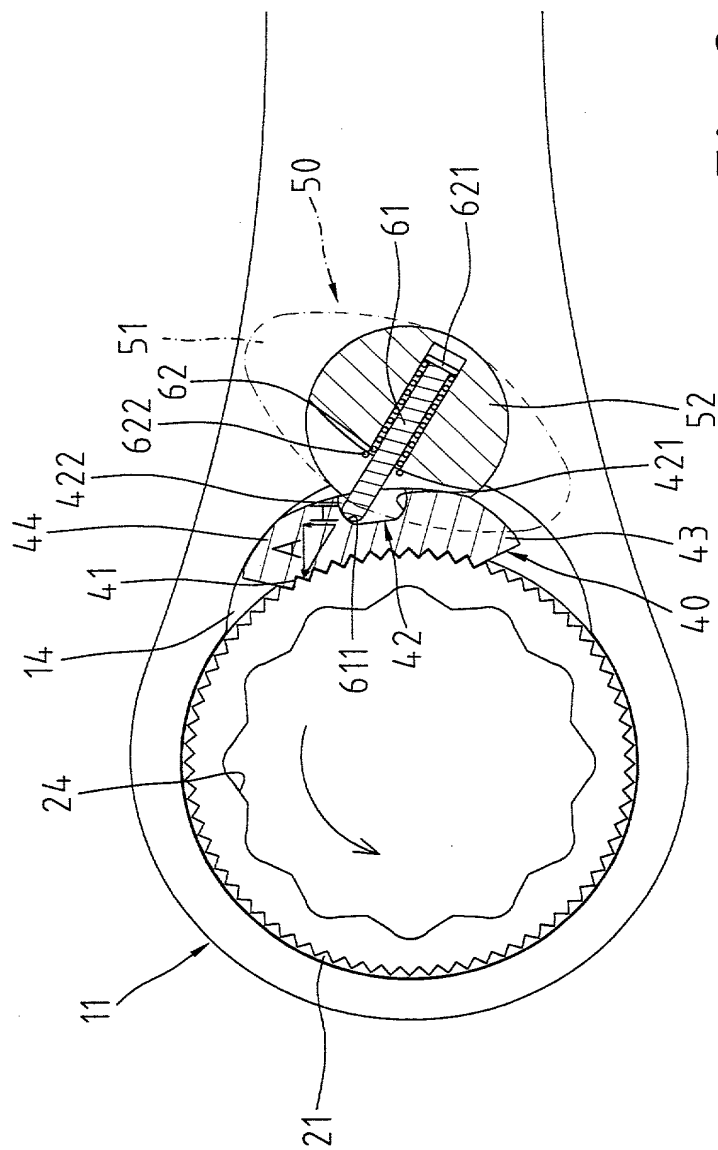


Fig. 3

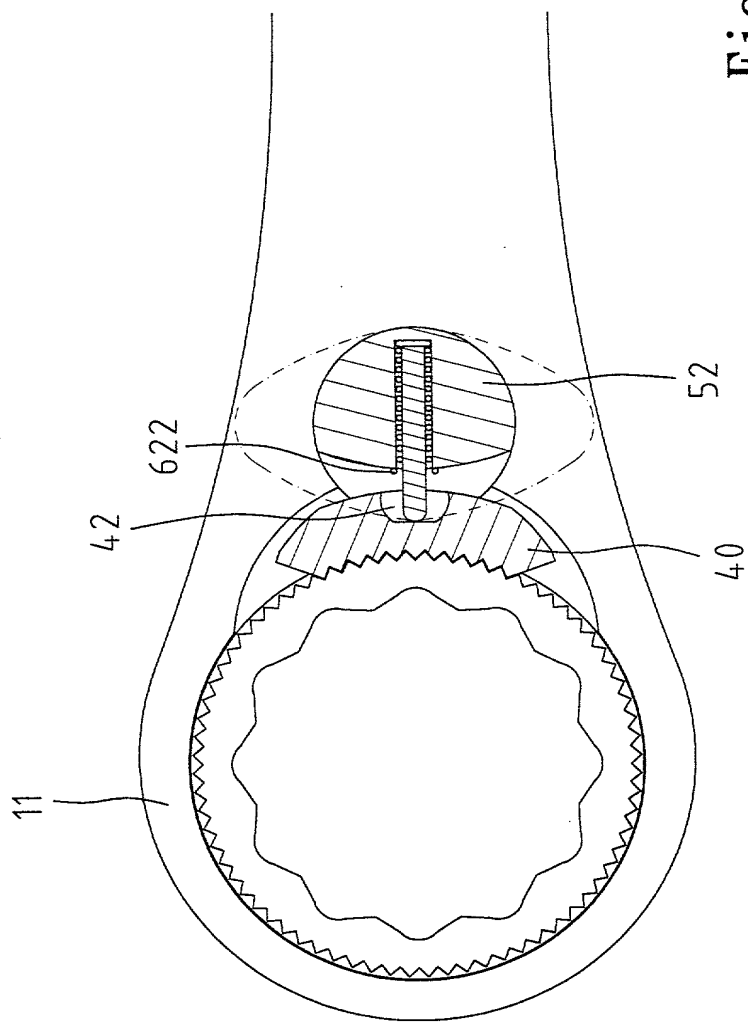


Fig. 4

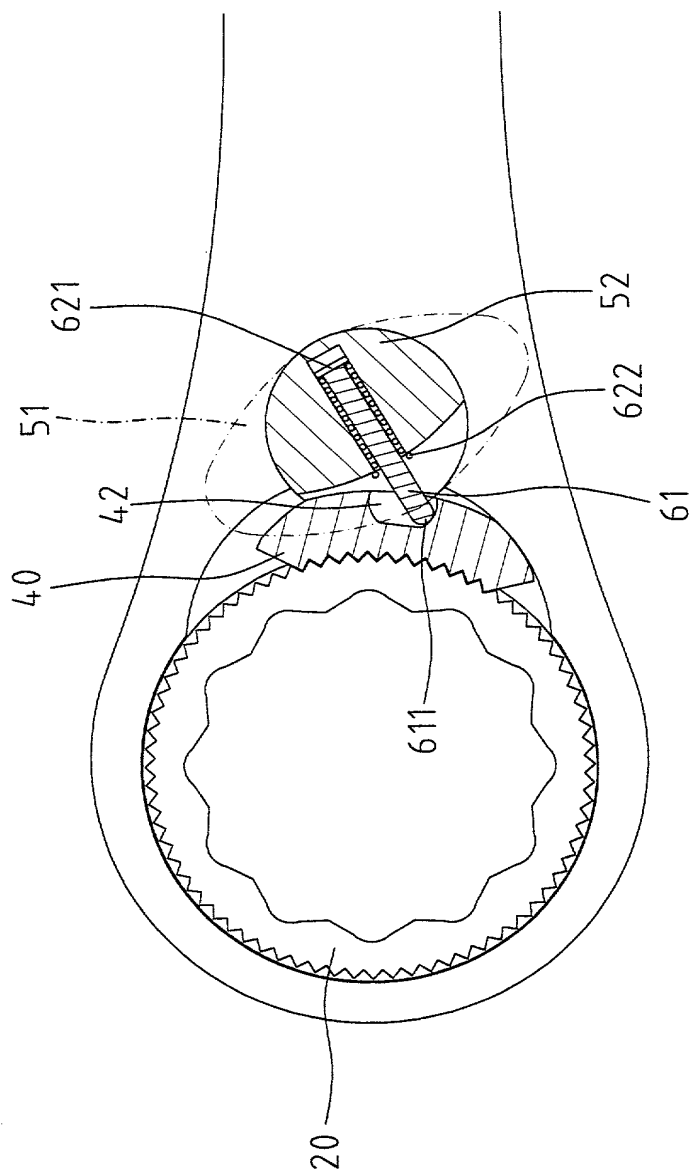


Fig. 5

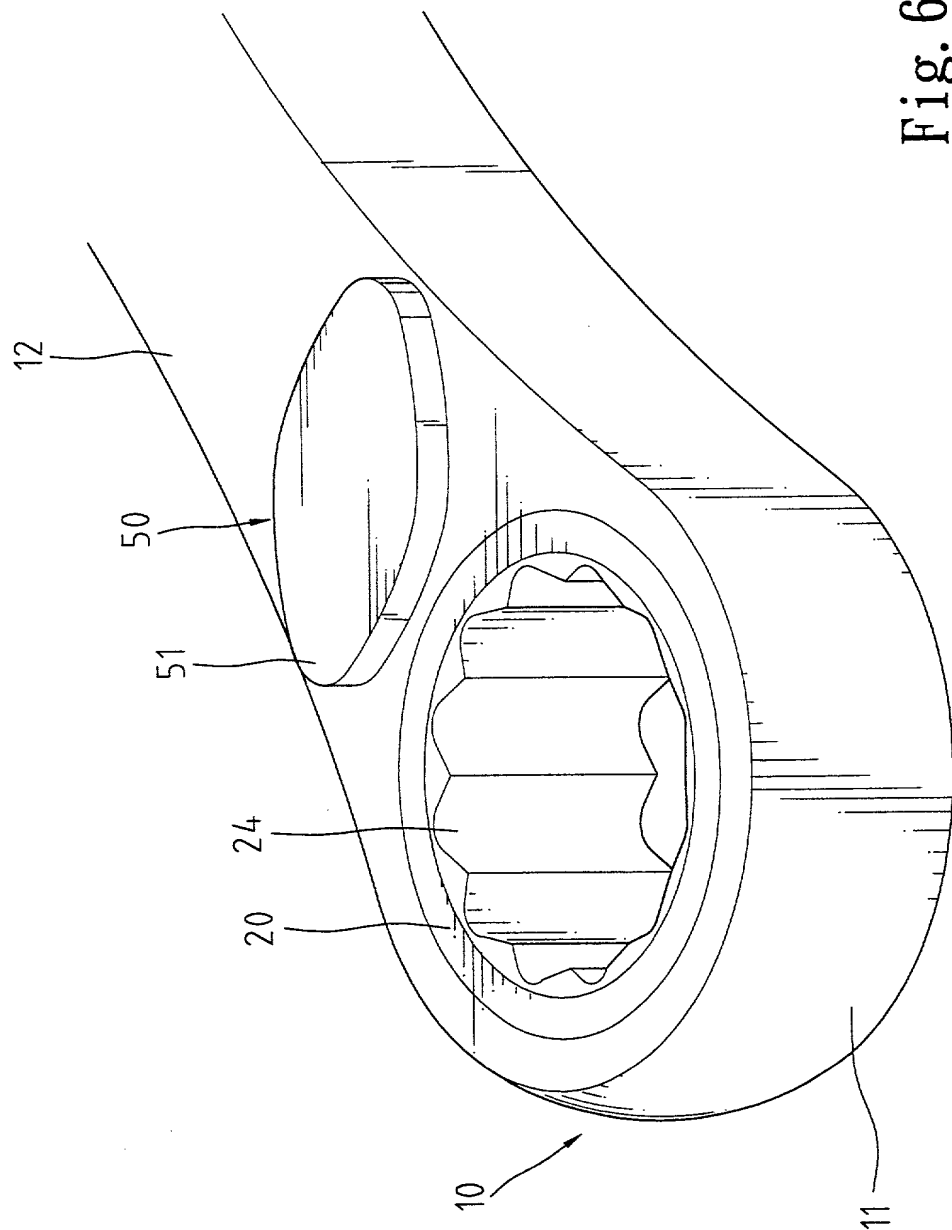


Fig. 6

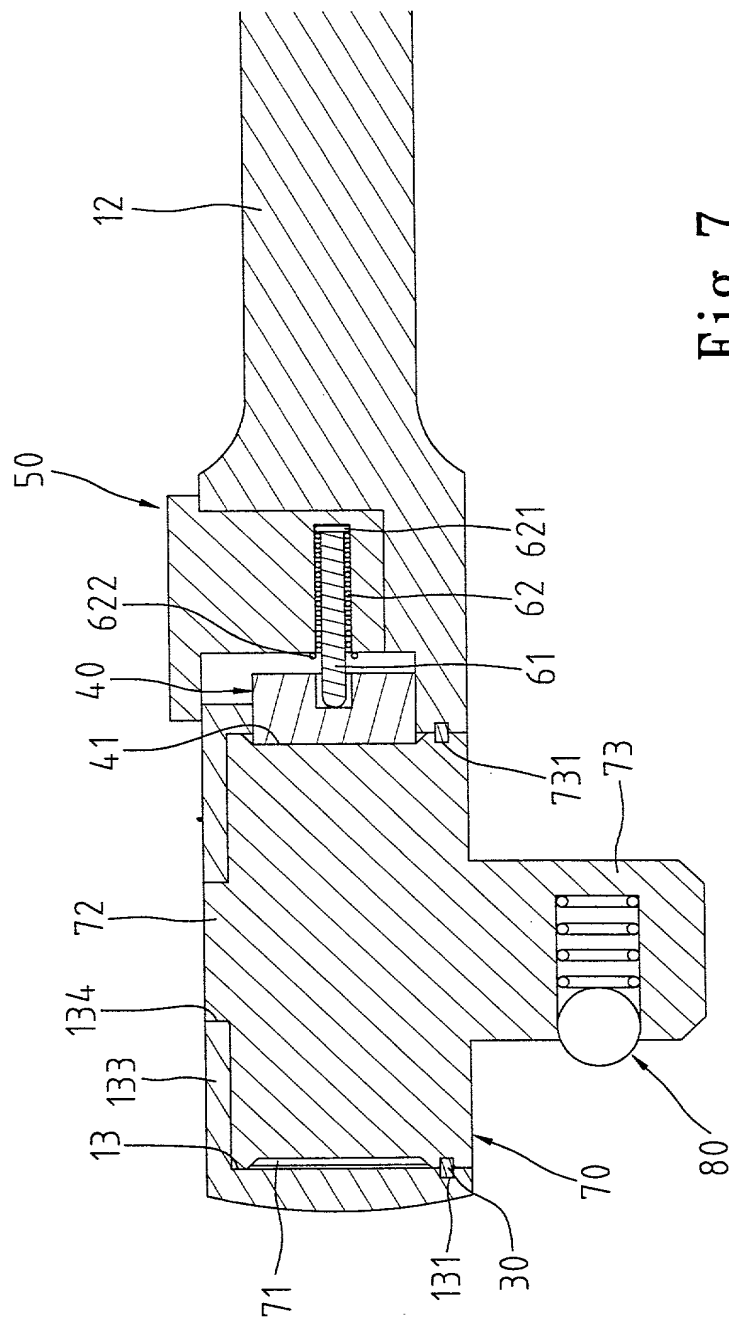


Fig. 7

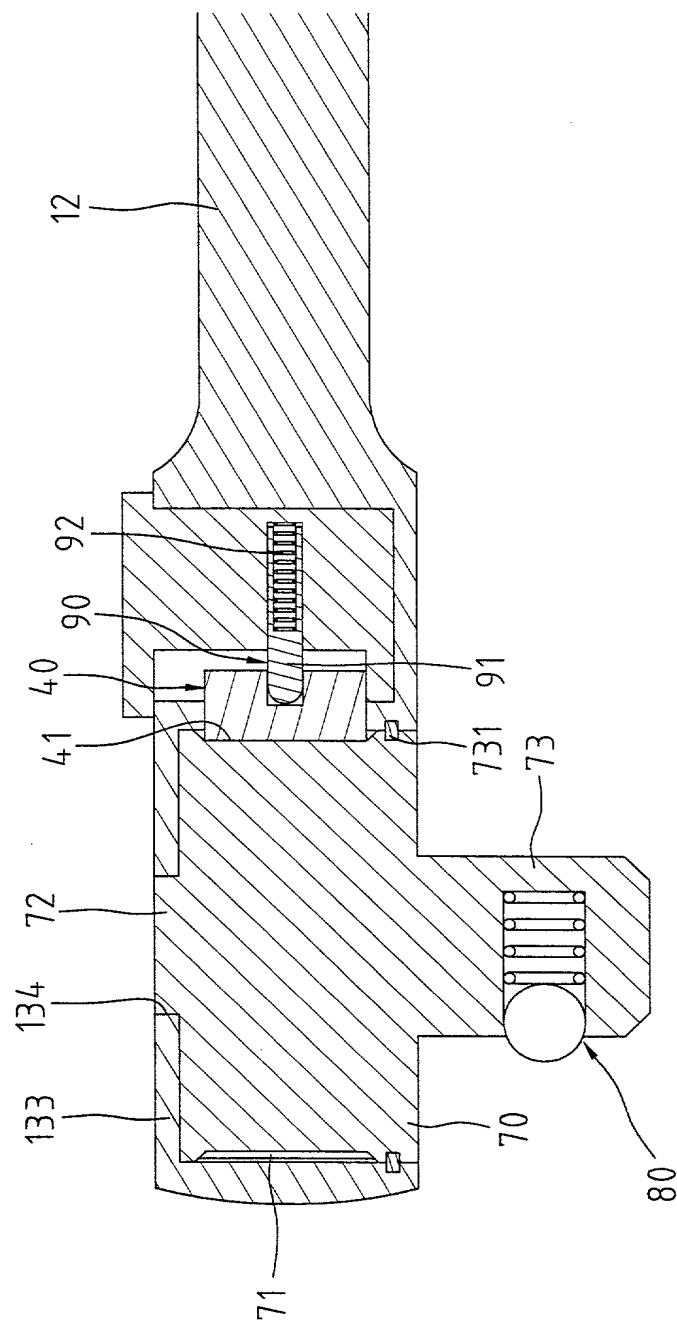


Fig. 9

Fig. 10

PRIOR ART

PRIOR ART

PRIOR ART

COMBINED DECLARATION/POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled Biassing Arrangement for a Pawl of a Reversible Ratchet-Type Wrench

the specification of which (check one)
☒ is attached hereto

☐ was filed on _____
 as U. S. Application
 Serial No. _____
 and was amended on _____
 (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefit(s) under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)		Day/Month/Year Filed	Priority Claimed	
<u>89202280</u>	<u>Taiwan</u>	<u>3 February 2000</u>	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
_____ (Number)	_____ (Country)	_____ Day/Month/Year Filed	<input type="checkbox"/> Yes	<input type="checkbox"/> No
_____ (Number)	_____ (Country)	_____ Day/Month/Year Filed	<input type="checkbox"/> Yes	<input type="checkbox"/> No
_____ (Number)	_____ (Country)	_____ Day/Month/Year Filed	<input type="checkbox"/> Yes	<input type="checkbox"/> No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37 Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

_____ (Application Serial No.)	_____ (Filing Date)	_____ (Status) (patented, pending, abandoned)
_____ (Application Serial No.)	_____ (Filing Date)	_____ (Status) (patented, pending, abandoned)

POWER OF ATTORNEY:

As a named inventor, I hereby appoint the following attorneys and agent:

Alan D. Kamrath
Reg.#28,227

to prosecute this application and

transact all business in the Patent and Trademark Office connected therewith.

Send correspondence to: **Plaza VII, Suite 3400**
45 South Seventh Street,
Minneapolis, MN 55402-1609

Direct telephone calls to: **(612) 607 7000**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor Bobby HUInventor's Signature _____ Date March 17, 2000

Residence No. 6, Alley 235, Lane 75, Section 3, Kang Ning Road,
Nei Hu District, Taipei, Taiwan. Citizenship Taiwan

Post Office Address P.O. Box 63-247, Taichung, Taiwan.

Full name of second joint inventor, if any _____

Second Inventor's Signature _____ Date _____

Residence _____ Citizenship _____

Post Office Address _____

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